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Proposed Registration Decision

PRD2010-11

Garlic Powder

(publié aussi en français)

14 May 2010

This document is published by the Health Canada Pest Management Regulatory Agency. For further information, please contact:

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HC Pub: 100238

ISBN: 978-1-100-15858-7 (978-1-100-15859-4)
Catalogue number: H113-9/2010-11E (H113-9/2010-11E-PDF)

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Overview

Proposed Registration Decision for Garlic Powder

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Garlic Powder Technical and Influence, containing the technical grade active ingredient garlic powder, to suppress powdery mildew on greenhouse cucumbers and tomatoes.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

This Overview describes the key points of the evaluation, while the Science Evaluation provides detailed technical information on the human health, environmental and value assessments of Garlic Powder Technical and Influence.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable¹ if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The Act also requires that products have value² when used according to the label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (e.g. children) as well as organisms in the environment (e.g. those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the PMRA's website at healthcanada.gc.ca/pmra.

¹ "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act*.

² "Value" as defined by subsection 2(1) of the *Pest Control Products Act*: "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (a) efficacy; (b) effect on host organisms in connection with which it is intended to be used; and (c) health, safety and environmental benefits and social and economic impact."

Before making a final registration decision on garlic powder, the PMRA will consider all comments received from the public in response to this consultation document³. The PMRA will then publish a Registration Decision⁴ on garlic powder, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA's response to these comments.

For more details on the information presented in this Overview, please refer to the Science Evaluation of this consultation document.

What Is Garlic Powder?

Garlic powder is the active ingredient in the end-product Influence. This wettable powder formulation is being registered in Canada for suppression of powdery mildew on greenhouse cucumbers and tomatoes.

Health Considerations

Can Approved Use of Garlic Powder Affect Human Health?

Garlic powder is unlikely to affect human health when used according to label directions.

Exposure to garlic powder may occur when handling and applying the product. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (e.g., children and nursing mothers). Only uses for which the exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

The technical grade active ingredient, garlic powder, is of low acute toxicity by the oral and dermal routes and is slightly irritating to eyes and skin. Due to the irritative nature of garlic, inhalation exposure may cause throat irritation. There is potential for skin sensitization to occur when skin is repeatedly exposed to the garlic powder. Therefore, cautionary statements alerting users to this sensitization concern are required on product labels.

Inhalation and dermal exposures are likely for occupational workers and commercial applicators. Anyone entering the sprayed areas in the greenhouse before the spray is dried may be exposed dermally. Therefore, personal protective equipment and a restricted entry statement are required on the end-use product label to mitigate such exposure concerns.

³ "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

⁴ "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Requests to waive short-term dermal toxicity, prenatal development toxicity and genotoxicity studies were accepted by the Pest Management Regulatory Agency. Waivers were based on the anticipated low dermal absorption and on the strength of evidence that there is little indication of short or long term toxic effects resulting from garlic's long history of consumption as a food and in natural health products.

Residues in Water and Food

Dietary risks from food and water are not of concern.

Garlic is used for culinary purposes world-wide and is also consumed for its medicinal values. Garlic powder is rapidly degraded in the environment, so exposure from residues in water and from treated food commodities is likely to be minimal. There is reasonable certainty that no harmful effects will occur from dietary exposure to garlic powder from the use of Influence.

Occupational Risks From Handling Influence

Occupational risks are not of concern when Influence is used according to label directions, which include protective measures.

Occupational exposure to individuals mixing, loading, or applying Influence is not expected to result in unacceptable risk when the product is used according to label directions.

Precautionary (e.g., wearing of personal protective equipment) and hygiene statements on the label are considered adequate to protect individuals from any unnecessary risk due to occupational exposure.

Environmental Considerations

What Happens When Garlic Powder is Introduced Into the Environment?

Garlic is a commodity that is grown and used around the world for both cooking and medicinal purposes. Garlic powder is very soluble in water. It is widely distributed and commercially available in the food industry for flavouring and seasoning. Garlic powder is expected to degrade rapidly in the environment.

The environmental exposure from the use of garlic powder is expected to be minimal for the proposed use in greenhouses. Garlic powder was not toxic to honey bees, on an acute contact basis. Thus, risk to terrestrial arthropods is expected to be negligible.

Value Considerations

What Is the Value of Influence ?

Powdery mildew of greenhouse tomato and cucumber is a serious disease that leads to reduction in crop quality. The registration of Influence will provide an additional mode of action to manage this disease.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law.

The key risk-reduction measures being proposed on the label of Influence to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

Human Health

The signal words "POTENTIAL SKIN SENSITIZER" and the statement "May cause skin sensitization" are required on the principal and secondary display panels, respectively, of both the technical and end-use product labels.

Mixer/Loader/Applicator and related workers are required to wear a long-sleeved shirt, long pants, water-proof gloves, shoes plus socks, and eye goggles when handling, mixing/loading or applying the product, and during all clean-up/repair activities. In addition, mixers and loaders must wear a dust/mist filtering respirator (dust mask) meeting a standard of at least N-95, R-95, P-95 or HE and applicators using a power sprayer must wear a bayonet-style cartridge respirator (for particulates) equipped with at least an N-95, R-95, P-95 or HE filter.

Both the technical product and the end use product labels have the statements, "CAUTION EYE IRRITANT" and "CAUTION SKIN IRRITANT" on the principal display panels, and the labels state that the handling of garlic powder and the end-use product be done in a well-ventilated room and caution handlers to avoid contact with eyes, skin and clothing.

Besides the statements "Avoid breathing dust" and "Avoid breathing dust and spray mists" on the technical product and the end use product labels, respectively, both the labels should include the statement, "May cause respiratory irritation" in the precaution sections.

To avoid bystander exposure, the Influence label states that unprotected persons should be kept out of the treated areas for the duration of the treatment period.

To prevent post-application exposure, the Influence label should have the restricted-entry statement, "Do not re-enter or allow re-entry into treated areas until the spray is dried."

To prevent microbial contamination of crops from spray solution, the Influence label should include the statement "Use freshly prepared spray solution each time" under directions for use.

Environment

Risk to non-target organisms is negligible. Environmental exposure will be mitigated by appropriate label precautions.

Next Steps

Before making a final registration decision on garlic powder, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency's response to these comments.

Other Information

When the PMRA makes its registration decision, it will publish a Registration Decision on garlic powder (based on the Science Evaluation of this consultation document). In addition, the test data referenced in this consultation document will be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa).

Science Evaluation

Garlic Powder

1.0 The Active Ingredient, Its Properties and Uses

1.1 Identity of the Active Ingredient

Active substance Garlic

Function

Chemical name

1. International Union of N/A
Pure and Applied
Chemistry (IUPAC)

2. Chemical Abstracts N/A
Service (CAS)

CAS number N/A

Molecular formula N/A

Molecular weight N/A

Structural formula N/A

Purity of the active
ingredient 100%

1.2 Physical and Chemical Properties of the Active Ingredient and End-Use Product

Technical Product—Garlic Powder

Property	Result
Colour and physical state	White-yellow powder
Odour	Slight garlic odour
Melting range	N/A (mixture of various compounds)
Boiling point or range	N/A (the product is solid)
Density	0.33- 0.35 g/cm ³
Vapour pressure at 20°C	N/A
Henry's law constant at 20°C	N/A

Property	Result
Ultraviolet (UV)-visible spectrum	N/A
Solubility in water	40 g/L
Solubility in organic solvents at 20°C (g/100 mL)	N/A
<i>n</i> -Octanol-water partition coefficient (K_{OW})	N/A
Dissociation constant (pK_a)	N/A
Stability (temperature, metal)	N/A

End-Use Product—Influence Biological Fungicide

Property	Result
Colour	White-yellow
Odour	Slight garlic odour
Physical state	Powder
Formulation type	Wettable powder
Guarantee	70.1%
Container material and description	Fiber drums Plastic: High density polyethylene (HDPE), polyethylene (PE), and polypropylene (PP)
Density	0.33 g/cm ³
pH	5.2 – 5.8
Oxidizing or reducing action	The active ingredient, garlic, is a mixture of various compounds. As a result, it might contain some oxidizing agents.
Storage stability	Not required.
Corrosion characteristics	The EP is not expected to be corrosive.
Explosibility	The EP is not expected to be explosive.

1.3 Directions for Use

Influence is a wettable powder formulation containing garlic powder as the active ingredient. Influence is used for suppression of powdery mildew on greenhouse cucumbers and tomatoes.

Influence should be applied preventatively or at first sign of symptoms at the rate of 6.9 kg product/ha. Repeat applications are required to maintain suppression of the disease. Ensure thorough coverage of foliage.

1.4 Mode of Action

Garlic powder causes loss of turgor and general collapse of fungal hyphae and spores.

2.0 Methods of Analysis

2.1 Methods for Analysis of the Active Ingredient

Based on the nature of the product, this requirement is waived.

2.2 Method for Formulation Analysis

Based on the nature of the product, this requirement is waived.

2.3 Methods for Residue Analysis

Methods for residue analysis were not required.

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

A detailed review of the toxicological database for garlic powder consisting of Tier I toxicity studies and waiver rationales was conducted. The scientific quality of the data is acceptable and the database is sufficiently complete to define the majority of the toxic effects that may result from exposure resulting from the intended use of this pest control product.

The applicant submitted acute toxicity (oral and dermal), irritation (ocular and dermal), and sensitization studies on dehydrated garlic powder (100 %). These studies (Table 1, appended) and information available from published literature were used to assess the toxicological effects of both the Garlic Powder Technical and Influence. Although the PMRA requires toxicity and irritation studies to be conducted with end-use product, given that the formulation contains no formulants of toxicological concern, testing with Garlic Powder Technical, was considered acceptable.

Garlic powder was of low acute toxicity by the oral and dermal routes in rats. The available acute toxicity information obtained from published literature supports low toxicity by these routes. No inhalation toxicity study was provided. Garlic powder is a known throat irritant. Due to the irritative nature of garlic powder, inhalation exposure is likely to cause irritation of the respiratory tract. Published cases are evidence that garlic dust may result in an immediate-type allergic reaction when inhaled. Inhalation exposure of garlic dust resulting in headache, rhinorrhea, shortness of breath, chest pain, bronchospasm, upper airway swelling or acute lung injury has been reported in the published scientific literature; also, bronchial asthma and allergic rhinitis can be caused by occupational exposure. The applicant submitted a request to waive acute inhalation toxicity testing which was acceptable on the basis of negligible exposure from inhalation if label directions are followed, which include mitigative statements and personal protective equipment requirements.

In irritation studies on rabbits, garlic powder was slightly irritating to the eye and the skin. From the available information obtained from published literature, it is likely that dermal and ocular exposure to garlic powder may result in more than slight irritation. Garlic powder was a dermal sensitizer on topical application in guinea pigs. Published literature indicates Type I dermal hypersensitivity, marked by urticaria in some individuals, following acute exposure to freshly crushed garlic and garlic oil. Repeated exposure may result in eczematous lesions characteristic of protein contact dermatitis.

Although the mutagenicity of garlic has been reported in several species of bacteria, garlic extract was found to be negative in both the micronucleus test in mouse bone marrow and the Ames test (*Salmonella typhimurium* - TA100 & TA1535 without metabolic activation). Based on the world-wide long history of safe consumption from food and medicinal uses it is unlikely that garlic powder is mutagenic in animals.

Furthermore, garlic powder is not known, or is suspected of being, carcinogenic, genotoxic, neurotoxic or a developmental/reproductive toxic compound. Therefore, requests to waive short-term and chronic toxicology studies were accepted.

3.2 Food Residue Exposure Assessment

The applicant provided a request to waive the requirement for plant metabolism studies and food residue data based on the use of garlic for culinary purposes and its purported health benefits. Garlic powder can be considered to be non-persistent in the environment based on the knowledge of its composition; e.g., organic material known to be rapidly degraded by biological, physical, and /or chemical processes to elemental constituents following the pesticide application; therefore, human exposure to biologically active pesticidal residues from Influence treated crops is expected to be minimal. Furthermore, washing treated produce before human consumption will further reduce pesticide residue intake. Because garlic powder has low oral toxicity and is primarily used world-wide as a food additive or food component, has a long history of safe consumption, and is valued for its benefits to human health, the request to waive plant metabolism and food residue studies was accepted.

Due to the low toxicity of the Garlic Powder Technical and no toxicological concerns associated with the formulants present in Influence, no adverse effects are anticipated from the presence of residues on food. The use of food-grade Garlic Powder Technical in the formulation further minimizes the potential for crop contamination by impurities. As a processed food ingredient, microorganisms may be naturally present in garlic powder preparations. To minimize microbial contamination of crops from Influence, users will be directed to prepare fresh spray solutions of Influence prior to each application.

In the United States, garlic is classified by the Food and Drug Administration as generally recognized as safe (GRAS). It is exempt from the requirement of a food tolerance as an active or inert ingredient because it is considered a commonly consumed food commodity under 40CFR 180.950(a).

There is reasonable certainty that no harmful effects will result from dietary exposure to residues of Influence based on the low levels of toxicity, the long history of safe consumption of garlic and the low potential for exposure. Levels of exposure resulting from use of Influence would be significantly lower than those found in the population's consumption of garlic-based foods (raw, cooked and processed). Consequently, the PMRA has not required the establishment of a maximum residue limit (MRL) for garlic powder.

3.3 Occupational and Bystander Risk Assessment

3.3.1 Use Description /Exposure Scenario

The proposed commercial use of Influence is as a foliar spray on greenhouse tomatoes and cucumbers to suppress powdery mildew. For application, the dose of the end-use product will range from 4.6–6.9 g/L (4.6–6.9 kg/hectare at a rate of 1000 L/hectare). Reapplication is proposed every 7 to 14 days depending on the disease incidence. The end-use product is to be applied by professional pesticide applicators with backpack or power sprayers. On average, an applicator can apply to 0.15 ha of greenhouse in a day with 0.69–1.0 kg of the EP (0.48–0.73 kg active ingredient). It is suggested on the product label to fill the tank mix or sprayer with a certain amount of clean water before adding the end-use product to avoid settling and to agitate constantly to maintain suspension of the solution.

3.3.2 Mixer, Loader and Applicator Exposure and Risk Assessment

Occupational exposure to Influence is expected to be short term and predominantly by the inhalation and dermal routes when workers are exposed during loading and mixing and when applicators are exposed to spray drift or to freshly treated wet plant surfaces. Occupational exposure to the EP will be minimal if workers follow label recommendations. The label has a number of exposure reduction statements (e.g., personal protective equipment, clothing, hygiene statement) to protect workers against any unnecessary risk from exposure. When handling, loading/mixing, and/or applying the EP, and during clean-up/maintenance activities workers should wear a long-sleeved shirt and pants, water-proof gloves, goggles, shoes, and socks. Also, the Influence label suggests that the individuals avoid contact of garlic powder/spray solution with skin, eyes or clothing, avoid breathing dust and spray mists, and the handling and loading of

the EP, as well as the clean-up and maintenance activities to be performed in a well ventilated area. Due to the irritant nature of garlic powder and to prevent respiratory irritation from the use of the EP, the PMRA requires a precautionary statement on the label to indicate the respiratory irritation potential of the EP. Also, mixers and loaders are required to wear a dust/mist filtering respirator (dust mask) meeting a standard of at least N-95, R-95, P-95 or HE and applicators using a power sprayer are required to wear a bayonet-style cartridge respirator (for particulates) equipped with at least an N-95, R-95, P-95 or HE filter.

Significant risk from exposure to Influence for the mixer, loader, and applicator, as well as those responsible for clean-up and maintenance activities is not anticipated, due to the low toxicity of the EP and reduced occupational exposure when label directions are followed.

3.3.3 Bystander Exposure and Risk Assessment

Bystander exposure is expected to be negligible to non-existent because the product is to be applied in greenhouses by commercial applicators, and the end-use product label states that unprotected persons should be kept out of the treated areas for the duration of the treatment period.

3.3.4 Post-Application Exposure

There are no post-application activities associated with the EP. To prevent post-application dermal exposure from wet surfaces, restricting entry until the spray is dried for workers/individuals following the EP application is recommended.

4.0 Impact on the Environment

4.1 Fate and Behaviour in the Environment

As per *PRO2007-02, Guidelines for the Registration of Low-Risk Biochemicals and Other Non-Conventional Pesticides*, no environmental fate data are required for Garlic Powder Technical or Influence. Garlic is grown and used around the world. Its constituents are expected to degrade rapidly in the environment. Garlic powder is soluble in water. It is widely distributed and commercially available in the food industry for flavoring and seasoning. Environmental exposure from the use of garlic powder is expected to be minimal for the proposed greenhouse use.

4.2 Risks to Non-Target Species

As per *PRO2007-02, Guidelines for the Registration of Low-Risk Biochemicals and Other Non-Conventional Pesticides*, only toxicity data for non-target arthropods are required under Tier I for greenhouse use. Garlic powder was non-toxic to honey bees, on an acute contact basis. The proposed use on greenhouse tomatoes and cucumbers will result in minimal exposure to terrestrial arthropods and negligible risk is expected.

5.0 Value

5.1 Effectiveness Against Pests

5.1.1 Acceptable Efficacy Claims

5.1.1.1 Suppression of powdery mildew (*Oidium neolycopersici* and *Leveillula taurica*) on greenhouse tomatoes

Two trials conducted in Quebec on tomatoes were reviewed to support the claim for suppression of powdery mildew. Trials were conducted with *O. neolycopersici*. Results of these trials showed that when applied at the proposed high rate of 6.9 kg product /ha, Influence suppressed powdery mildew caused by *O. neolycopersici* under moderate to high disease pressure. Percent control of powdery mildew varied from 30 to 50%. The low proposed rate was not tested. The claim for suppression of powdery mildew caused by *O. neolycopersici* on tomatoes is supported at the high rate of 6.9 kg product /ha. Claims for suppression of powdery mildew caused by *L. taurica* on tomatoes was not supported because data demonstrating efficacy of Influence on that pest were not provided.

5.1.1.2 Suppression of powdery mildew (*Podosphaera xanthii* and *Erysiphe cichoracearum*) on greenhouse cucumbers

Four trials conducted in Quebec on cucumbers were assessed to support the claim for suppression of powdery mildew on cucumbers. Influence applied at the proposed rates of 4.6 and 6.9 kg/ha under high disease pressure significantly reduced disease severity by 20 to 90%. No significant differences were observed between the low and the high rate, however, the 6.9 kg/ha rate provided higher numerical reduction of the disease in one trial. Influence performed as well as the commercial standards Nova and Milstop. Claims for suppression of powdery mildew caused by *E. cichoracearum* on cucumbers was not supported because data demonstrating efficacy of Influence on that pest were not provided.

5.2 Phytotoxicity

No phytotoxicity was reported in any of the trials.

5.3 Economics

Not assessed.

5.4 Sustainability

5.4.1 Survey of Alternatives

A list of alternatives is available in Appendix I, Table 2.

5.4.2 Compatibility with Current Management Practices Including Integrated Pest Management

Not assessed.

5.4.3 Information on the Occurrence or Possible Occurrence of the Development of Resistance

No information is available on the occurrence of pathogen resistance to garlic powder.

5.4.4 Contribution to Risk Reduction and Sustainability

Not assessed.

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e., persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the review process, Garlic Powder Technical was assessed in accordance with the PMRA Regulatory Directive DIR99-03⁵ and evaluated against the Track 1 criteria. The PMRA has reached the following conclusions:

- Garlic powder does not meet the Track 1 criteria and is not expected to form any transformation products which meet the Track 1 criteria. Garlic powder is derived from natural sources and is not expected to be persistent or bioaccumulative in the environment.

⁵ DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical and formulants and contaminants in the end-use products are compared against the *List of Pest control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*⁶. The list is used as described in the PMRA Notice of Intent NOI2005-01⁷ and is based on existing policies and regulations including: DIR99-03; and DIR2006-02⁸, and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

- Garlic Powder Technical and the end-use product Influence do not contain any formulants or contaminants of health or environmental concern identified in the *Canada Gazette*.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02.

7.0 Summary

7.1 Human Health and Safety

The available information for garlic powder is adequate to qualitatively identify the toxicological hazards that may result from human exposure to garlic powder. Garlic powder is of low acute toxicity by oral and dermal routes. It is slightly irritating to skin and eyes, and is a potential skin sensitizer. Repeated dermal exposure to Garlic Powder Technical and Influence can result in skin sensitization. Due to the irritative nature of garlic powder, inhalation exposure is likely to cause irritation of the respiratory tract.

Occupational exposure to Influence is expected to be minimal if the precautionary statements and recommended personal protective equipment on the product label, which are intended to minimize worker exposure, are observed. Bystander exposure is likely to be negligible to nonexistent. Post-application exposure can be minimized by restricted entry.

The dietary risk due to exposure to garlic powder from the use of the proposed end-use product is considered negligible. The Agency did not establish maximum residue limit (MRL) for Garlic Powder.

⁶ *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-114 (2005-11-30) pages 2641-2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613. *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

⁷ NOI2005-01, List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern under the New Pest Control Products Act.

⁸ DIR2006-02, PMRA Formulants Policy.

7.2 Environmental Risk

Based on the proposed use pattern which includes application on greenhouse food crops, Garlic Powder Technical and its end-use product Influence present a negligible risk to non-target terrestrial and aquatic organisms.

7.3 Value

Influence is a low risk product for use on greenhouse cucumbers and tomatoes to suppress powdery mildew.

7.4 Unsupported Uses

Table 3 in Appendix I summarizes the unsupported and supported claims

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Garlic Powder Technical and Influence, containing the technical grade active ingredient garlic powder, to suppress powdery mildew on greenhouse cucumbers and tomatoes.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

Human Health

The signal words "POTENTIAL SKIN SENSITIZER" and the statement "May cause skin sensitization" are required on the principal and the secondary display panels, respectively, of both the technical and end-use product labels.

Mixer/Loader/Applicator and related workers are required to wear a long-sleeved shirt, long pants, water-proof gloves, shoes plus socks, and eye goggles when handling, mixing/loading or applying the product, and during all clean-up/repair activities. In addition, mixers and loaders must wear a dust/mist filtering respirator (dust mask) meeting a standard of at least N-95, R-95, P-95 or HE and applicators using a power sprayer must wear a bayonet-style cartridge respirator (for particulates) equipped with at least an N-95, R-95, P-95 or HE filter.

Both the Technical and the end use product labels have the statements, "CAUTION EYE IRRITANT" and "CAUTION SKIN IRRITANT" on the principal display panels, and the labels state that the handling of garlic powder and the end-use product be done in a well-ventilated room and caution handlers to avoid contact with eyes, skin and clothing.

Besides the statements "Avoid breathing dust" and "Avoid breathing dust and spray mists" on the Technical and the end use product labels, respectively, both the labels should include the statement, "May cause respiratory irritation" in the precaution sections.

To avoid bystander exposure, the Influence label states that unprotected persons should be kept out of the treated areas for the duration of the treatment period.

To prevent post-application exposure, the Influence label should have the restricted-entry statement, "Do not re-enter or allow re-entry into treated areas until the spray is dried."

To prevent microbial contamination of crops from spray solution, the Influence label should include the statement "Use freshly prepared spray solution each time" under directions for use.

Environment

Risk to non-target organisms is negligible. Environmental exposure will be mitigated by appropriate label precautions.

List of Abbreviations

bw	body weight
cm ³	cubic centimetre
EP	end use product
g	gram
GRAS	generally regarded as safe
ha	hectare(s)
kg	kilogram
K_{ow}	<i>n</i> -octanol-water partition coefficient
L	litre
mg	milligram
mL	millilitre
MAS	maximum average score
MIS	maximum irritation score
MRL	maximum residue limit
pK _a	dissociation constant
PCPA	Pest Control Products Act
PMRA	Pest Management Regulatory Agency
TGAI	technical grade active ingredient
TSMP	Toxic Substances Management Policy

Appendix I Tables and Figures

Table 1 Summary of acute toxicity and irritative effects information for Dehydrated Garlic Powder (100%).

STUDY	SPECIES/STRAIN AND DOSES	RESULT	TARGET ORGAN/ SIGNIFICANT EFFECTS/ COMMENTS	REFERENCE (PMRA #)
Oral toxicity (Up and down procedure). Exposure by gavage. 14-day observation	Rat - Sprague-Dawley (4 ♀) A single oral dose of Dehydrated Garlic Powder in deionized water (40% w/v) by gavage at a dose of 5000 mg/kg bw	LD ₅₀ (♀) > 5000 mg/kg bw Low Toxicity	One non-treatment related mortality (1/4)	1665152
Dermal toxicity 24-hour exposure 9-day observation	Rat - Sprague-Dawley (5/sex) A single dose of 5050 mg/kg bw moistened with 1.0 mL of deionized water/g test substance for 24 hours to 10% of body surface area	LD ₅₀ (♂ ♀) > 5050 mg/kg bw Low Toxicity	One non-treatment related mortality (1/10). Dermal irritation showed erythema, desquamation, eschar, blanching, alopecia and site discoloration.	1665156
Eye Irritation 7-day observation	Rabbit - New Zealand White (2 ♂, 1 ♀) Dose: 0.1 mL (33.7 mg). After 24-hour exposure, any residual test material in the eyes was removed by gently rinsing with deionized water for 1 minute.	Maximum average score (MAS) = 14.2/110 (at 24, 48, & 72 hours). Maximum irritation score (MIS) was 16.3/110 (at 24 hr). Slightly irritating	Mild irritation up to day-4 post-treatment Irritation was resolved by day-7 post-treatment.	1665160

STUDY	SPECIES/STRAIN AND DOSES	RESULT	TARGET ORGAN/ SIGNIFICANT EFFECTS/ COMMENTS	REFERENCE (PMRA #)
Dermal Irritation 4-hour exposure 14-day observation	Rabbit - New Zealand White (2 ♂, 1 ♀) Dose: 500 mg of Dehydrated Garlic Powder moistened with 0.5 mL of deionized water at each test site and covered with semi-permeable dressing. Observations at 1, 24, 48 and 72 hours and 7, 10, and 14 days after removal of dressing and washing the test sites with tap water. Irritation was scored by the method of Draize.	Primary irritation score: MAS = 1/8 (at 24, 48, & 72 hours). Slightly irritating	All animals showed very slight erythema at each observation through Day 14. No edema was observed at any time points.	1665162
Dermal Sensitization	Guinea pigs - Hartley albino (topical application) Test group: 20 (10/sex) Control group: 10 (5/sex) <i>Induction phase</i> 400 mg of test substance moistened with 0.4 mL of deionized water once each week for a three week induction period of 6 hour exposure Irritancy evaluated by method of Draize, 24 and 48 hours after first induction application and after 24 hours for the remaining induction treatments. Control group remained untreated during the induction exposure. <i>Challenge phase</i> Two weeks after the last induction exposure. Dose: 400 mg of test substance moistened with 0.4 mL of deionized water at virgin sites.	Positive Skin sensitizer	Dehydrated Garlic Powder produced no irritation in the control animals, but very faint irritation in the test animals after the challenge treatment. All animals showed body weight gain. Mildly sensitizing at the concentration tested.	1665164

STUDY	SPECIES/STRAIN AND DOSES	RESULT	TARGET ORGAN/ SIGNIFICANT EFFECTS/ COMMENTS	REFERENCE (PMRA #)
	<p>Control group treated during the challenge similarly like the test group.</p> <p>Observations were made at 24 and 48 hours after challenge treatment.</p> <p>Primary irritation indices and primary irritation scores were calculated after each sensitizing and challenge application of test substance.</p>			

Table 2 List of Active Ingredients Currently Registered on Grape, Melons, Pumpkin, Winter Squash, head and Leaf Lettuce, Stone fruits, Strawberry and Hops

Crop	Disease	Fungicide Active Ingredients
Greenhouse tomatoes	Powdery mildew (<i>Oidium neolycopersici</i>)	<ul style="list-style-type: none"> • Sulfur • Copper • <i>Bacillus subtilis</i>
Greenhouse cucumbers	Powdery mildew (<i>Podosphaera xanthii</i>)	<ul style="list-style-type: none"> • Potassium bicarbonate • Chlorothalonil • Pyraclostrobin

Table 3 Use (label) Claims Proposed by Applicant and Whether Acceptable or Unsupported

Proposed Claims	Supported Claims
Tomatoes: Suppression of powdery mildew caused by <i>Oidium neolycopersici</i> and <i>Leveillula taurica</i> with Influence applied at the rate of 4.6 to 6.9 kg/ha in 1000L of water /ha. Subsequent applications may be made every 7-14 days if symptoms persist.	Tomatoes: Suppression of powdery mildew caused by <i>Oidium neolycopersici</i> with Influence applied at the rate of 6.9 kg/ha in 1000L of water /ha. Subsequent applications may be made every 7-14 days if symptoms persist.
Cucumbers: Suppression of powdery mildew caused by <i>Podosphaera xanthii</i> and <i>Erysiphe cichoracearum</i> with Influence applied at the rate of 4.6 to 6.9 kg/ha in 1000L of water /ha. Subsequent applications may be made every 7-14 days if symptoms persist.	Cucumbers: Suppression of powdery mildew caused by <i>Podosphaera xanthii</i> with Influence applied at the rate of 6.9 kg/ha in 1000L of water /ha. Subsequent applications may be made every 7-14 days if symptoms persist.

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